

Rr2004Test1and4dataanalysis

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Test 1 Data Analysis

2004

Kydex, WSTF No. 04-38645

25.9% O₂ @ 14.3 psia

Test Results (Burn Lengths, cm)

JAXA	MSFC	ESA	WSTF
6.5	7.6	1.0	4.6
5.5	6.6	5.1	5.6
4.5	6.1	5.1	5.6
4.3	6.6	5.4	5.3
5.5	6.9	5.6	5.1

Statistics on burn length data for Kydex, 25.9% O₂ @ 14.3 psia

	\bar{x}_{cave}	S_{n-1}	d	\bar{x}_{avec}	s_x	s_r	h	k
JAXA	5.26	0.79	-0.17	5.43	0.97	1.00	-0.18	0.79
MSFC	6.76	0.49	1.33				1.37	0.49
ESA	4.44	1.73	-0.99				-1.02	1.73
WSTF	5.24	0.37	-0.19				-0.20	0.37

- Shaded cells in the Test Results Table indicate individual results that do not fit the overall NASA STD 6001 pass/fail pattern
- Shaded cells in h column indicate a probability of at least 95% that the average value is significantly different than the averages from other labs
- Shaded cells in k column indicate greater within-laboratory variability than the average for all laboratories

Data analysis

- Considering NASA STD 6001 pass/fail criteria, all labs provided consistent results
- Statistically there was no significant inconsistency among the average values obtained by the labs
- ESA obtained results with greater within-laboratory variability than the average for all laboratories. The critical k has been exceeded, indicating that statistically the variability was significantly larger when compared with variability from all labs combined
- Statistically, two extreme data points (1.0 cm, ESA and 4.6 cm, WSTF) could occur by chance within the ESA and WSTF data population, respectively, less than 5% of the time. There is a possibility for these data points to have resulted from nonrandom causes.

1993-2002 round robin history: With three exceptions, all labs passed this material under these conditions in the past.

Probability of a sample failing: 3.1%

$$h_{cr} = 1.49$$

$$k_{cr} = 1.66$$

Test 1 Data Analysis (Continued)

Kydex, WSTF No. 38645

30% O₂ @ 10.2 psia

Test Results (Burn Lengths, cm)

JAXA	MSFC	ESA	WSTF
5.0	7.9	6.0	5.3
5.5	7.6	5.8	5.8
5.0	7.4	5.9	5.1
6.7	9.9	14.8	5.3
5.5	7.4	5.7	5.6

Statistics on burn length data for Kydex, 30% O₂, @ 10.2 psia

	\bar{x}_{cave}	S_{n-1}	d	\bar{x}_{avec}	s_x	s_r	h	k
JAXA	5.54	0.62	-1.12	6.66	1.37	1.88	-0.82	0.33
MSFC	8.04	0.95	1.38				1.00	0.51
ESA	7.64	3.58	0.98				0.72	1.90
WSTF	5.42	0.25	-1.24				-0.91	0.20

Data analysis

- Considering NASA STD 6001 pass/fail criteria, all labs provided consistent results
- Statistically there was no significant inconsistency among the average values obtained by the labs
- ESA obtained results with greater within-laboratory variability than the average for all laboratories. The critical k has been exceeded, indicating that statistically the variability was significantly larger when compared with variability from all labs combined
- Statistically, three extreme data points (6.7 cm, JAXA; 9.9 cm, MSFC; 14.8 cm, ESA) could occur by chance within the respective data populations less than 5% of the time. There is a possibility for these data points to have resulted from nonrandom causes.

2000-2002 round robin history: With one exception, all labs passed this material under these conditions in the past.

Probability of a sample failing: 2.5%

$$h_{cr} = 1.49$$

$$k_{cr} = 1.66$$

Test 1 Data Analysis (Continued)

Royal Blue Cotton, Flame Resistant (WST No. 04-38644)

30% O₂ @ 10.2 psia

Test Results (Burn Lengths, cm)

JAXA	MSFC	ESA	WSTF
9.5	10.4	14.0	10.7
9.0	16.8	10.5	10.7
10.5	9.7	10.5	11.2
12.0	10.7	10.0	11.7
10.5	10.7	10.0	11.4

Statistics on burn length data for Royal Blue Cotton, Flame Resistant

	\bar{x}_{cave}	S_{n-1}	d	\bar{x}_{avec}	s_x	s_r	h	k
JAXA	10.30	1.03	-0.71	11.01	0.56	1.60	1.27	0.64
MSFC	11.66	2.60	0.65				1.16	1.63
ESA	11.00	1.52	-0.01				0.02	0.95
WSTF	11.08	0.40	0.07				0.13	0.25

Data analysis

- Considering NASA STD 6001 pass/fail criteria, the labs provided inconsistent results. MSFC failed the material, while all other labs passed it
- Never-the-less, statistically there was no significant inconsistency among the average values obtained by any labs
- The critical k has not been exceeded, indicating that statistically the intra-laboratory variability was not great enough to cause concern for any of the labs
- Statistically, two extreme data points (16.8 cm, MSFC; 14.0 cm, ESA) could occur by chance within the MSFC and ESA population, respectively, less than 5% of the time. There is a possibility for these data points to have resulted from nonrandom causes.

Round robin history: This material was tested for the first time in 2004.

$$h_{cr} = 1.49$$

$$k_{cr} = 1.66$$

Test 1 Data Analysis (Continued)

Silicone
20.9% O₂ @ 14.7 psia
Test Results (Burn Lengths, cm)

JAXA	MSFC	ESA	WSTF F/B	KSC
16.5	11.7	7.5	9.1	7.6
13.0	10.9	7.4	7.6	10.2
11.0	14.0	6.8	10.4	10.2
13.0	9.7	7.3	11.7	10.2
11.5	10.4	7.6	10.2	8.9

Statistics on burn length data for Silicone

	\bar{x}_{cave}	S_{n-1}	d	\bar{x}_{avec}	s_x	s_r	h	k
JAXA	13.00	1.92	2.82	10.18	2.13	1.34	1.32	1.43
MSFC	11.34	1.48	1.16				0.54	1.10
ESA	7.32	0.28	-2.86				-1.34	0.21
WSTF	9.80	1.38	-0.38				-0.18	1.03
KSC	9.42	1.04	-0.76				-0.36	0.78

Data analysis

- Considering NASA STD 6001 pass/fail criteria, the labs provided inconsistent results. JAXA failed the material, while all other labs passed it
- Never-the-less, statistically there was no significant inconsistency among the average values obtained by any labs
- The critical k has not been exceeded, indicating that statistically the intra-laboratory variability was not great enough to cause concern for any of the labs
- Statistically, four extreme data points (16.5 cm, JAXA; 14.0 cm, MSFC; 7.6 cm, WSTF; 7.6 cm, KSC) could occur by chance within the respective data populations less than 5% of the time. There is a possibility for these data points to have resulted from nonrandom causes.

Round robin history: This material was tested for the first time in 2004.

$$h_{cr} = 1.74$$

$$k_{cr} = 1.71$$

Test 4 Data Analysis

Raychem Electrical Wire, MIL M22759/32-20-9

30% O₂ @ 10.2 psia

Test Results (Burn Lengths, cm)

JAXA	MSFC	WSTF
5.5	10.9	28.7
10.3	5.3	26.7
11.3	15.0	29.7
13.0	21.1	17.0
11.5	24.6	16.0

Statistics on burn length data for Raychem Electrical Wire, MIL M22759/32-20-9

	\bar{x}_{cave}	S_{n-1}	d	\bar{x}_{avec}	s_x	s_r	h	k
JAXA	10.32	2.56	-6.12	16.44	6.71	5.45	-0.91	0.47
MSFC	15.38	6.92	-1.06				0.16	0.19
WSTF	23.62	5.90	7.18				1.07	1.08

Data analysis

- Considering NASA STD 6001 pass/fail criteria, the labs provided inconsistent results on the material. MSFC and WSTF failed the material, while JAXA passed it. The data indicates that the test conditions were close to the sustained flammability threshold, where variable effects are enhanced.
- However, statistically there was no significant inconsistency among the average values obtained by the labs and the critical k has not been exceeded, indicating that statistically the intra-laboratory variability was not significantly larger when compared with variability from all labs combined. These results can be explained by the relatively low values for h and k , due to the relative large data variability
- Statistically, one data point (5.5 cm, JAXA) could occur by chance within the JAXA data population less than 5% of the time. There is a possibility for this data point to have resulted from nonrandom causes.

1993-2003 round robin history:

Probability of a sample passing: 31%

Probability of all samples passing: 6%

Probability of all samples failing: 33%

Probability of obtaining mixed results: 61%

$$h_{cr} = 1.15$$

$$k_{cr} = 1.56$$

Test 4 Data Analysis

Raychem Electrical Wire, MIL M81044/12-20-9
20.9% O₂ @ 14.7 psia
Test Results (Burn Lengths, cm)

JAXA	MSFC	WSTF	ESA
5.7	9.4	7.4	6.0
6.0	6.6	8.1	5.5
6.0	5.8	7.9	7.5
10.0	6.4	4.6	5.0
7.0	11.4	6.1	5.0

Statistics on burn length data for Raychem Electrical Wire, MIL M81044/12-20-9

	\bar{x}_{cave}	S_{n-1}	d	\bar{x}_{avec}	s_x	s_r	h	k
JAXA	6.94	1.59	0.07	6.87	0.87	1.56	0.08	1.02
MSFC	7.92	2.14	1.05				1.21	1.37
WSTF	6.82	1.31	-0.05				0.06	0.84
ESA	5.80	0.93	-1.07				1.23	0.60

Data analysis

- Considering NASA STD 6001 pass/fail criteria, all labs provided consistent results
- Statistically there was no significant inconsistency among the average values obtained by the labs
- The critical k has not been exceeded, indicating that statistically the intra-laboratory variability was not great enough to cause concern for any of the labs
- Statistically, three extreme data points (10.0 cm, JAXA; 4.6 cm, WSTF; 7.5 cm, ESA) could occur by chance within the respective data populations, respectively, less than 5% of the time. There is a possibility for these data points to have resulted from nonrandom causes.

1993-2002 round robin history: With three exceptions, all labs passed this material under these conditions in the past.

Probability of a sample failing: 3.0%

$$h_{cr} = 1.49$$

$$k_{cr} = 1.66$$